

Refractory Coated/Lined Low Density Structures, Phase II

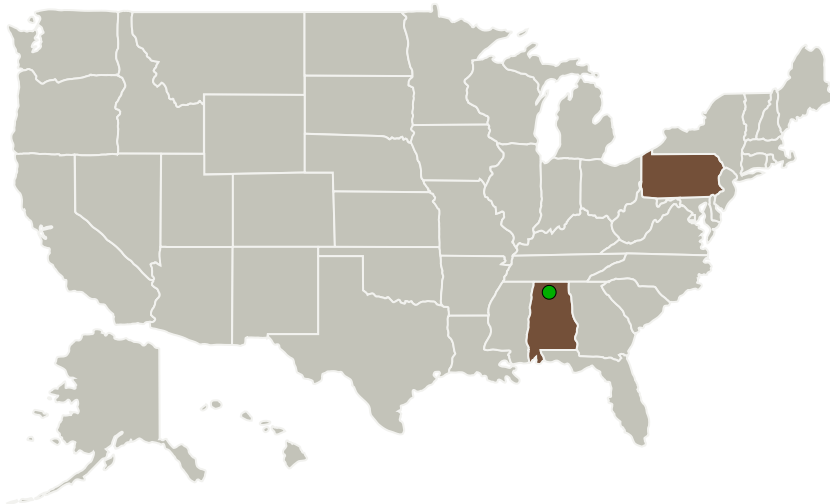
Completed Technology Project (2011 - 2016)



Project Introduction

This project addresses the development of refractory coated or lined low density structures applicable for advanced future propulsion system technologies. The fundamental idea behind this concept was to design a hot-walled refractory material (ceramic and/or metallic) in the form of a thin coating or liner and have that supported by a low density structure such as graphite or various carbon-carbon composites, offering an attractive lightweight design option. This coated or lined low density structure combines the compatibility and hermetic seal of the ceramic and/or metallic hot-walled material with a lightweight, high strength to weight ratio support material such as graphite or carbon-carbon composites. The advantage of this particular concept can be observed by both the weight and cost savings compared to, for example, current solid monolithic refractory propulsion components. Lightweight structures are desirable for space transportation vehicle systems in order to reduce launch costs, increase mission flexibility, increase mission efficiency and add robustness with respect to the ability to add weight or additional materials to the mission with minimum sacrifice in performance. This general concept is applicable to thrust vector controls, combustion chambers, nozzles and thrusters. One study has shown that replacing a solid monolithic rhenium pintle and seat with a rhenium lined graphite version can offer both weight and cost savings as high as 80 - 90%.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Materials Research and Design, Inc.	Lead Organization	Industry	Wayne, Pennsylvania
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Pennsylvania

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Materials Research and Design, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joseph H Pluscauskis

Co-Investigator:

Joseph Pluscauskis

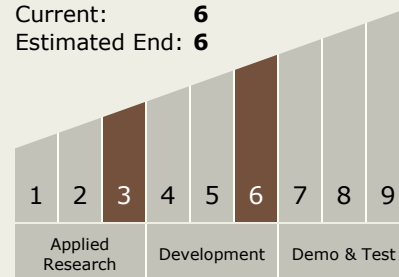
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Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System